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## Design of a novel high-precision beam diagnostic beamline

*Thursday 5 June 2025 15:30 (2 hours)*

A novel high-precision beam diagnostic system has been designed for slice emittance and energy spread measurements. The 20-meter diagnostic platform integrates eight quadrupoles, a deflecting cavity, and an energy spectrometer, achieving 100fs temporal resolution in both operational modes through the same beam-line layout. The emittance measurement mode provides 50-fold horizontal magnification, while the energy spread measurement mode reaches 1.71 keV theoretical energy resolution through optimized dispersion and screen rotation. Comprehensive error analysis confirms measurement precision of  $3.05\% \pm 0.69\%$  for relative emittance changes and  $4.82 \pm 1.35$  keV for energy spread variations, demonstrating the effectiveness of this flexible design for high-precision beam diagnostics.

### Footnotes

### Paper preparation format

Word

### Region represented

Asia

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